Developing Computer Literacy of Bilingual Students

via CLIL Methodology

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Abstract

The research intended to present the scientific basis of CLIL and validate CLIL technology's implementation in a Russian higher education institution to develop computer literacy of Russian bilingual learners experimentally. Consequently, we acquired two essential scientifically proven procedures for implementing science education and math for multilingual learners in the educational institutions of The Republic of Tatarstan, Russia. The initial one indicates that bilingual learners can adjust their mother language to the bilingual education program's Russian education environment. The second one includes the concept of language immersion: educating bilingual learners utilizing the Russian language. In compliance with the first strategy, we devised computer-assisted learning assistance of CLIL implementation to evolve bilingual Tatar learners' computer literacy in teaching Informatics. The bilingual resource is made up of seven modules. It has been developed with the aid of commonly available technologies as well as Web 2.0 services. The investigation was managed to demonstrate the efficiency of CLIL technology to develop computer literacy of Tatar learners. The Institute of Philology and Intercultural Communication of Kazan Federal University was adopted as a site for the experiment: 69 students of the first year of education participated in the pilot experiment. The experiment outcomes revealed that CLIL, as a technology to teach Informatics, improves the development of bilingual learners' computer literacy.

Keywords: CLIL Methodology, bilingual education, computer literacy, Bilingual Students, Russian higher education institution, computer-assisted learning assistance

1. Introduction

The significance of the study is stemmed from numerous factors. Initially, the process of globalization and computerization reinforces the development and spreading of bilingualism. The development of ICT has formed a global information community, in which diverse cultures and peoples interact. ICT skills help as an instrument of communication and transfer of technologies.

Secondly, Russian Federation officials declared the students' training, who have the knowledge and abilities to use ICT tools and techniques, as leading educational policy factors.

Thirdly, the current generation begins learning ICT in early childhood and uses them spontaneously, whereas forming information culture and computer literacy takes place in educational institutions.

Next, the process of developing computer literacy in bilingual regions may have difficulties. The educational process is mainly designed with the use of non-native language. Besides, there is a low level of integration of bilingual's mother tongue into ICT. Thus, there is a need to build an educational process with the use of bilingual technologies (Bezuglova et al., 2019).

There is a lack of research related to developing computer skills of bilingual students under conditions where the mother tongue is used for informal communication. However, the Russian language is used as the language of instruction.

The analysis of the current state of pedagogical science revealed a contradiction between, on the one hand, the necessity to provide the developing of computer literacy of bilingual pupils over the course of professional training within the modern Russian higher education system and, on the other hand, low grade of improvement and implementation of bilingual education technologies in the higher education level (Korucu, 2017).

The research problem is: what are pedagogical conditions to apply the bilingual education model for the beneficial development of students' computer literacy?

2. Methods

Overall, the survey targeted the scientific basis of CLIL and verified CLIL technology's implementation in a Russian higher education institution to enhance Russian bilingual learners' computer literacy practically.

The following hypotheses were established in order to examine and gain answers to the above questions:

- Is the development of the bilingual students' computer literacy will be useful if the framework of computer literacy of students is updated, considered as the core element of information culture, and criteria, and indicators of the levels of computer literacy are developed?

- Is the bilingual students' development of computer literacy useful if CLIL, designed initially to learn curriculum subject through a foreign language and widespread in Europe, is adapted and implemented in a natural (Tatar-Russian) bilingual educational process the Russian higher education level?

- Is the bilingual students' developing of computer literacy will be effective if the CLIL-based computer literacy development system is designed?

Following the purpose and hypotheses, the subsequent research tasks were defined:

1.   Clarifying the structure and components of computer literacy as the core of information culture on the basis of scientific analysis of philosophical, psycho-pedagogical, and methodological literature in the context of informatization and globalization.

2.   Designing and verifying CLIL technology implementation in a Russian higher education institution to develop Russian bilingual students' computer literacy experimentally.

3.   Designing and implementing a CLIL-based computer literacy development system based using technologies such as wiki, screencasting, parallel texts, Web 2.0 services, etc.c.

The study was divided into several stages in order to solve the research problems. First, we analyzed such concepts as "computer literacy", "information literacy," and "information culture". Computer literacy is defined as the core concept of our research, which means that the successful development of information literacy and information culture depends on the level of personal computer literacy.

In the paper, computer literacy is considered as the degree of personal proficiency to use computer hardware and software tools in educational and professional activities. This definition is based on the works of Robert, Grinshkun, Grigoriev, Kuznetsov, Chalkina (Salekhova et al., 2016).

It is necessary to note that the idea of computer literacy is historically changeable and relies on developing computer technology and technological progress in society.

We developed our own system of computer literacy components. It consists of the following four constituents: system-information, office, search, and psychological components. The three levels of development have been identified for each component, criteria, and indicators.

Moreover, the development of personal computer literacy in bilingualism was analyzed through the Republic of Tatarstan in the Russian Federation. On one side, according to the constitution, there are two official state languages used on the territory of the Republic of Tatarstan: they are Russian and Tatar.

As a consequence, two types of bilingualism (Russian-Tatar and Tatar-Russian) are widespread. On the other side, The Republic of Tatarstan is one of Russia's leaders in developing information technologies and the scale of its implementation in various fields of activity, including education.

Despite the efforts made by teachers and researchers to integrate the Tatar language into Computer Science education, some factors prevent the significant development of bilingual (Tatar-Russian) student's computer literacy:

- Tatar language is less-common on the Internet and almost not used in the ICT field. The Russian language is the dominant language in the space of electronic communications in the Republic of Tatarstan. That is why Tatar-speaking user is forced to overcome difficulties with understanding and mastering graphical interface or a set of instructions of computer programs, written in a non-native for him the language.

- Tatar-speaking students have an insufficient level of Russian academic language proficiency. They may have difficulties while training in high school and universities because instruction is conducted in Russian in almost all higher educational institutions.

- There are linguistic differences between the Russian and Tatar languages. The Tatar language is an agglutinative one: it is a type of synthetic language with morphology that primarily uses agglutination. The Russian language is synthetic. Therefore, it is difficult for the student with a native Tatar language to understand the word formation in the Russian language, which entails misunderstanding of the meaning of speech.

To overcome these obstacles, there is a crucial need to apply bilingual education through the Tatar and Russian languages in the process of developing students' computer literacy.

As a result of scientific literature analysis, two main approaches were distinguished to the realization of bilingual education in schools and institutions of the Republic of Tatarstan:

- The first approach is focused on the language adaptation of bilingual students to the Russian-speaking educational environment using bilingual education;

- The second approach is the complete immersion, that is, the training of bilingual students in Russian.

In our study, we followed the first approach. The technology of bilingual learning "Content and Language Integrated Learning (CLIL)" was used to develop computer literacy for bilingual students in conditions of natural Tatar-Russian bilingualism.

The CLIL technology idea lies in the simultaneous learning of the subject matter of the discipline and non-native (foreign) language. CLIL is well developed and successfully used in the educational process of European universities. Step by step it is spreading in higher educational institutions and schools of the Russian Federation for studying in a foreign language.

The theoretical framework of CLIL technology is based on the 4C principle, suggested by Do Coyle, Jim Cummins's Threshold theory and Two-factor model of communication, Benjamin Bloom's taxonomy of educational objectives (Coyle et al., 2010; Coyle et al., 2009; Yakaeva et al., 2018; Zaripova, 2015).

The implementation of CLIL technology in conditions of Tatar-Russian bilingualism was based on the following principles:

- focus on the development of the Russian academic language (so-called CALP);

- the subject-oriented approach of bilingual education;

- intensification of the educational process;

- authenticity;

- cognitive scaffolding in ICT;

- scaffolding in the Russian language;

- individualization of training;

- multiculturalism;

- interactivity;

- psychological comfort.

3. Results and Discussion

Afterward, we designed the CLIL-based computer literacy development system. The system was implemented in the computer science course. The central part of the system is the educational wiki web site named "Computer science in a bilingual (Russian-Tatar) manner" (Wikia-based Bilingual Computer Science Course Homepage, 2019). The site has 7 parts: all parts are oriented to develop the components of computer literacy (Computer Literacy Skills, 2014; Chalkina, 2010; Goldhammer et al., 2012; James, 2012). In the process of design, the following technologies were used:

- M.Chashanov's didactic engineering framework (Choshanov, 2016).
- 'Tiz.Yaz' virtual Tatar keyboard for Android OS.
- Parallel Russian-Tatar texts.
- Multimedia content created using screencasting.
- Visual elements created using wiki-markup (acronyms, collapsible tables, etc.).

The investigation was conducted to demonstrate CLIL technology's efficiency in developing Tatar students' computer literacy. The Institute of Philology and Intercultural Communication of Kazan University was selected as a spot to conduct the experiment: 69 first-year learners participated in the pilot experiment.

Students were divided into control and experimental collection. The experimental team is the collection of learners trained by CLIL technology in developing computer literacy at the "Computer science" course. The control team is the team of students taught by traditional methodology in developing computer literacy at the 'Computer science' course. The experiment lasted two years.

In order to examine and gain answers to the research questions, the following zero and alternative hypotheses were proposed:

H_0– the application of CLIL in the 'Computer science' course doesn't influence the development of computer science of bilingual students.

H_1– the application of CLIL in the 'Computer science' course influences the development of computer science of bilingual students.

In the final phase of the experiment, both groups passed the test. The test was conducted to evaluate the computer literacy improvement level between the control and experimental group. The test's time limit was set to evaluate the development of the psychological component of computer literacy. Statistical examination revealed that the Wilcoxon-Mann-Whitney value of the experimental team is $W_{emp}=7.140$ is more than the critical value for alpha=0.05 significance level (W=1.96). Thus, there is a statistically sharp contrast between the control and experimental team, and we can accept the alternative hypothesis.

The testing results revealed that the use of CLIL, as a means to teach Informatics, boost the improvement of bilingual students' computer literacy.

4. Conclusion

The following results were obtained during the research:

- the development of personal information culture is dependent on computer literacy;
- the structure and components of computer literacy of Tatar speaking students have been clarified, criteria and indicators of the levels of its development have been identified;
- the principles and approaches of CLIL bilingual education technology aimed at using a non-native language as a mean of instruction were adapted for use in the context of Tatar-Russian bilingualism;
- The computer literacy development system was designed and developed on the basis of the CLIL bilingual education principles. It helps to implement a scaffolding strategy while developing bilingual student's computer literacy;
- The experimental work results confirm the hypothesis that the development of computer literacy of Tatar-speaking students using the CLIL bilingual education technology by means of Russian and Tatar languages is more effective than using monolingual instruction.

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